IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	:	10/674,926
Applicant	:	Claus Michael Olsen, et al.
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TC/A.U.	:	2187
Examiner	:	Bradley, Matthew A.
Docket No.	:	YOR920030005US1
For	:	Apparatus for Reducing Accesses to Levels of a
	:	Storage Hierarchy in a Computing System

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

BRIEF OF APPELLANT

This Appeal Brief, pursuant to the Notice of Appeal filed April 7, 2009, is an appeal from the rejection of the Examiner in the Office Action dated December 11, 2008.

Real Party in Interest

Lenovo Corporation is the real party in interest.

Related appeals and interferences

None.

Status of Claims

Claims 21, 22, 24-35, 37 and 38 are rejected. Claims 1-20, 23, 36, and 39-40 are canceled. This Brief is in support of an appeal from the rejection of claims 21, 22, 24-35, 37 and 38.

Status of amendments

There are no after-Final Amendments that have not been entered.

Summary of claimed subject matter

A. **Independent Claim 21.**

The present invention provides for an information processing system that includes first and second levels of a non-volatile storage hierarchy (page 6, lines 6-7), wherein accessing information in the first level consumes more energy than accessing information in the second level (page 6, lines 8-10, and page 7, lines 16-17); and a processor (see block 102 of figure 1, page 7, line3) configured for writing information to the second level of storage based on energy-conserving criteria (page 7, lines 22-24), wherein the energy-conserving criteria comprise system state information, and wherein said system state information is selected from a type of energy source powering the system (page 5, lines 19-26).

B. **Independent claim 37**

The present invention provides a method for managing storage of information in an information processing system (see figure 2, page 10, lines 16-17) comprising two levels of non-volatile (page 7, lines 5-7) storage wherein a first level is managed and a second level is unmanaged (page 7, lines 21-24) wherein storing information in managed storage consumes less energy than storing information in unmanaged storage (page 7, lines 16-19), the method comprising: monitoring the information processing system to determine whether an operating state of said information processing system satisfies one or more energy-conserving criteria (page 5, lines 19-26);

storing only strategically selected storage data in managed storage when the operating state of the information processing system satisfies the one or more energy-conserving criteria (page 20, lines 19-23); and

storing all storage data in unmanaged non-volatile storage when the operating state of the information processing system does not satisfy the one or more energy-conserving criteria (page 20, lines 19-24);

wherein the energy-conserving criteria comprise system state information, and wherein said system state information is selected from a type of energy source powering the system (page 20, lines 20-26).

C. **Independent claim 38**

38. A computer readable medium (see block 108 in figure 1) comprising program instructions for: monitoring a system to determine whether an operating state of the system satisfies one or more energy-conserving criteria (page 5, lines 19-26); storing only strategically selected storage data in managed non-volatile storage when the operating state of the system satisfies the one or more energy-conserving criteria (page 20, lines 19-23); and

storing all storage data in non-managed non-volatile storage when the operating state of the system does not satisfy the one or more energy-conserving criteria (page 20, lines 19-24); wherein the energy-conserving criteria comprise system state information, and wherein said system state information is selected from a type of energy source powering the system (page 20, lines 20-26).

Grounds of Rejection to be reviewed on appeal

1. Claims 21-22, 24-26, 29-31 and 37-38 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Rudelic (U.S. Publication No. U.S. 2004/0255283, hereafter *Rudelic*) in view of Mirov (U.S. Patent 6,838,824, hereafter *Mirov*).

2. Claims 27-28 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over *Rudelic* in view of *Mirov* and further in view of Thelander (U.S. Publication No. 2003/0009705, hereafter *Thelander*).

3. Claim 32 stands rejected under U.S.C. §103(a) as allegedly being unpatentable over *Rudelic* in view of *Mirov* and further in view of Atkinson (U.S. Patent 6,029,249, hereafter *Atkinson*).

4. Claims 34-35 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over *Rudelic* in view of *Mirov* and further in view of Kimura (U.S. Patent No. 6,415,359, hereafter *Kimura*).

ARGUMENT

1. Grounds of Rejection 1.

Claims 21-22, 24-26, 29-31 and 37-38 have been rejected under 35 USC §103(a) as being obvious over *Rudelic* in view of hereafter *Mirov*. The Examiner argued that claim 21 was rendered obvious by the combination of *Rudelic* and *Mirov*, alleging that the claimed element of "first and second levels of a non-volatile storage" were taught by *Rudelic* but admitted that *Rudelic* did not teach "a processor configured for writing information to the second level of storage based on energy-conserving criteria, wherein the energy-conserving criteria comprise system state information, and wherein said system state information is selected from a type of energy source powering the system." For the second element the Examiner argued that *Mirov* taught that limitation. Appellant contends that this is clear error that should be reversed. *Mirov* teaches a variable power supply that may be adjusted according to the requirements of the system. The variable power supply of *Mirov* does not control storage of information according to the power available. The teaching is just the opposite of what the claim requires, which is a processor that controls the writing of information to a lower energy consuming level of storage

based on the type of energy source powering the system, such that when the energy source produces a low level of energy, a level of storage is used that consumes less energy.

Claims 22 and 24-26 depend on claim 21 and thus include the limitations discussed above and hence are not obvious in view of the combination of *Rudelic* and *Mirov* for the same reasons that claim 21 would not have been obvious.

Claim 37 is an independent claim directed to a method of managing storage of information that includes a limitation substantially equivalent to that discussed above with respect to claim 21. As shown above, the combination of *Rudelic* and *Mirov* does not teach or suggest storage of data in unmanaged storage depending on the type of energy source powering the system. Claim 38 is an article of manufacture counterpart of claim 37 and is patentable over the cited references for at least the same reasons as discussed above.

2. Grounds of Rejection 2.

Claims 27-28 are patentable under 35 U.S.C. §103(a) over *Rudelic* in view of *Mirov* and further in view of *Thelander*. Claims 27 and 28 are patentable over the cited references because they include the processor of claim 21 by virtue of their dependence on claim 21. Moreover, claim 27 further requires that the system stores current user profiles and the system state information comprises whether storage input/output data are associated with a current user profile. The Examiner concedes that *Thelander* does not teach or suggest the limitations of claim 27 but alleges that *Thelander* does teach the limitations. A careful review of *Thelander* reveals that *Thelander* does not discuss a user profile at all and does not discuss that the system state information data are associated with a current user profile. The only profiles discussed in *Thelander* are a power management profile and a client profile database, not a user profile. See *Thelander*, paragraph [0048], and see also Abstract (an authorized party may configure and maintain a power management profile for each computer in the network). The discussion of the client profile interface does not refer to a user interface but rather to a client profile interface that is not the same or equivalent to the claimed user profile. Claim 28 requires that the system stores current user preferences. *Thelander* does not disclose any user preferences. Instead, at

paragraph [0080] *Thelander* discusses "enforcement preferences" which are not the same as or the equivalent of user preferences.

3. **Grounds of Rejection 3.**

Claim 32 stands rejected under U.S.C. §103(a) as allegedly being unpatentable over *Rudelic* in view of *Mirov* and further in view of *Atkinson* (U.S. Patent 6,029,249). Claim 32 includes the limitations of claim 21 relating to the way the processor determines to which level of storage to write information and thus is patentable for at least the same reasons that claim 21 is patentable. The Examiner concedes that the combination of *Rudelic* and *Mirov* do not teach counting remaining write cycles but alleges that *Atkinson* teaches this limitation. *Atkinson* does not discuss anything relating to *remaining* write cycles. Instead, *Atkinson* discusses "the system monitors other events in addition to, or instead of, the cache read hit rate, such as the occurrence of page hits or input/output (I/O) write cycles, to determine the level of activity of the computer system." There is no discussion of ***remaining*** write cycles at all.

4. Grounds of Rejection 4.

Claims 34-35 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over *Rudelic* in view of *Mirov* and further in view of *Kimura*. The Examiner also concedes that the combination of *Rudelic* and *Mirov* do not teach usage of disk based non-volatile storage devices and is silent on a mapping schema between cache files in the first level storage but alleges that *Kimura* teaches the foregoing. This is an error.

Claim 34 requires that the second level storage comprises "a mapping schema between cache files in the second level of the non-volatile storage and disk files in the first level of the non-volatile storage" and that "each cache file is named with a logical cluster number of its corresponding disk file." In support, the Examiner cites the following from *Kimura*: "The file management unit 102 manages information such as a file name, a storing location in the secondary memory 17, an update information, a last access time, etc., using a cache management

table as shown in FIG. 2, in order to manage files stored in the secondary memory 17." *Kimura*, col. 7, lines 31-35. This says nothing about any mapping schema or any naming of files, except a mere mention of "file name." Such a general teaching falls far short of the specific requirements of claim 34.

Claim 35 requires that the system of claim 21 comprises an application-specific integrated circuit for managing the cache according to the energy-conserving criteria. While *Kimura* discloses a disk drive it fails to mention an application-specific integrated circuit or ASIC that manages the cache. The file management unit 102 of *Kimura* is not identified as an ASIC nor is it identified as specifically managing the cache.

SUMMARY

In summary, Appellant respectfully requests reversal of the December 11, 2008 Office Action rejection of claims 21, 22, 24-35, 37 and 38. The undersigned authorizes the Director to charge the Appeal Brief filing fee and any fees as appropriate to Deposit Account Number 50-3533.

Respectfully submitted,

/Michael J. Buchenhorner/
Michael J. Buchenhorner
Reg. No. 33,162

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Claims appendix

21. An information processing system comprising:

first and second levels of a non-volatile storage hierarchy, wherein accessing information in the first level consumes more energy than accessing information in the second level; and

a processor configured for writing information to the second level of storage based on energy-conserving criteria, wherein the energy-conserving criteria comprise system state information, and wherein said system state information is selected from a type of energy source powering the system.

22. The system of claim 21 wherein the energy-conserving criteria comprise criteria compiled using a heuristic approach.

24. The system of claim 21 further comprising a storage input/output subsystem and wherein system state information comprises whether the storage input/output subsystem is using one or more specific files.

25. The system of claim 24 wherein the system state information is further selected from a group consisting of:

storage input/output data associated with one or more predetermined software applications;

a sequence of storage input/output operations; and

observed interactions with the first level of the non-volatile storage hierarchy and wherein the collection of heuristics infer a state of the second level of the non-volatile storage hierarchy.

26. The system of claim 21 wherein the energy-conserving criteria comprise limiting use of parts of a file system.

27. The system of claim 25 wherein the system stores current user profiles and the system state information comprises whether storage input/output data are associated with a current user profile.

28. The system of claim 25 wherein the system stores current user preferences and the system state information comprises whether storage input/output data are associated with current user preferences.

29. The system of claim 24 wherein the system state information comprises at least one factor from among the following factors:

storage input/output data associated with characteristics of a connection between the first and second levels of the non-volatile storage hierarchy;

the storage input/output data associated with characteristics of a connection between the system and at least one second level of the storage hierarchy;

a proximity of the storage input/output data to events that change the state of the at least one first level of the non-volatile storage hierarchy;

the proximity of the storage input/output data to a previous interaction with at least one first level of the non-volatile storage hierarchy;

an indication of a hard-disk drive spin-down event; and

physical characteristics of the second level of the non-volatile storage hierarchy.

30. The system of claim 21 wherein the system state information comprises physical characteristics of the second level of the non-volatile storage hierarchy.

31. The system of claim 21 wherein the second level of the non-volatile storage hierarchy is implemented using Flash memory.

32. The system of claim 21 wherein the system state information comprises the number of remaining write cycles.

33. The system of claim 21 wherein the processor is for removing information from the second level of the non-volatile storage based on energy-conserving criteria.

34. The system of claim 21 wherein the second level of the non-volatile storage further comprises: a mapping schema between cache files in the second level of the non-volatile storage and disk files in the first level of the non-volatile storage, wherein each cache file is named with a logical cluster number of its corresponding disk file.

35. The system of claim 21, further comprising:

a hard disk drive, the hard disk drive comprising rotating magnetic media comprising the first level of the non-volatile storage and a cache comprising the second level of the non-volatile storage; and

an application-specific integrated circuit for managing the cache according to the energy-conserving criteria.

37. A method for managing storage of information in an information processing system comprising two levels of non-volatile storage wherein a first level is managed and a second level is unmanaged wherein storing information in managed storage consumes less energy than storing information in unmanaged storage, the method comprising:

monitoring the information processing system to determine whether an operating state of said information processing system satisfies one or more energy-conserving criteria;

storing only strategically selected storage data in managed storage when the operating state of the information processing system satisfies the one or more energy-conserving criteria; and

storing all storage data in unmanaged non-volatile storage when the operating state of the information processing system does not satisfy the one or more energy-conserving criteria;

wherein the energy-conserving criteria comprise system state information, and wherein said system state information is selected from a type of energy source powering the system.

38. A computer readable medium comprising program instructions for:

monitoring a system to determine whether an operating state of the system satisfies one or more energy-conserving criteria;

storing only strategically selected storage data in managed non-volatile storage when the operating state of the system satisfies the one or more energy-conserving criteria; and

storing all storage data in non-managed non-volatile storage when the operating state of the system does not satisfy the one or more energy-conserving criteria;

wherein the energy-conserving criteria comprise system state information, and wherein said system state information is selected from a type of energy source powering the system.

Evidence appendix

None.

Related proceedings appendix

None.